

SEQUENCE LISTING

Sub
B4
<110> KIRIN BEER KABUSHIKI KAISHA

<120> Endo- β -N-Acetylglucosaminidase Gene

<130> PH-657-PCT

<140>

<141>

<150> JP98/141717

<151> 1998-05-22

<160> 37

<170> PatentIn Ver. 2.0

<210> 1

<211> 2369

<212> DNA

<213> Mucor hiemalis

<400> 1

gtcgaccac gcgtccgcgg acgcgtgggc ggacgcgtgg gcggacgcgt gggttttatt 60
ttacataaat atgccttcac ttcaattgca acctgatgac aaactagcac ctgtttcttt 120
tgcacttaag tctatgaatg agttgaggga ctggacgcca gacgaaaaga taaagtttaa 180
cgtttcaagc gtggcactac agcctcgtgt gaaaaacgcc ctgaaacctc aattattgtt 240
aactcatgat atggcaggag gatataaaga agataaaaaat attcaaggaa acaattataa 300

agttcataga tattatggaa cattgaactg ggaaaacaca gcaaatgtag taaacgcttg 2100
 ggaggaaata gattactaca acgtttttta caaagaaagt gacgactctg caactcgcat 2160
 ctttttagga acagcattct gtaatcaatt tcgtgtatct ggtttagata ttattttatc 2220
 taagctacca aagatagtta ttgaagctgt taacaaagaa ggatacatct cttcaagtgg 2280
 tagcatagat ttgtcattaa actaggactt gaaataaaat attatgataa agaaaaaaaa 2340
 aaaaaaaaaa aaaaaaaaaag ggcggccgc 2369

<210> 2

<211> 2235

<212> DNA

<213> Mucor hiemalis

<220>

<221> CDS

<222> (1)..(2235)

<400> 2

atg cct tca ctt caa ttg caa cct gat gac aaa cta gca cct gtt tct	48
Met Pro Ser Leu Gln Leu Gln Pro Asp Asp Lys Leu Ala Pro Val Ser	
1 5 10 15	
ttt gca ctt aag tct atg aat gag ttg agg gac tgg acg cca gac gaa	96
Phe Ala Leu Lys Ser Met Asn Glu Leu Arg Asp Trp Thr Pro Asp Glu	
20 25 30	
aag ata aag ttt aac gtt tca agc gtg gca cta cag cct cgt gtg aaa	144
Lys Ile Lys Phe Asn Val Ser Ser Val Ala Leu Gln Pro Arg Val Lys	
35 40 45	
aac gcc ctg aaa cct caa tta ttg tta act cat gat atg gca gga gga	192
Asn Ala Leu Lys Pro Gln Leu Leu Leu Thr His Asp Met Ala Gly Gly	

50	55	60	
tat aaa gaa gat aaa aat att caa gga aac aat tat aaa gac att tat	240		
Tyr Lys Glu Asp Lys Asn Ile Gln Gly Asn Asn Tyr Lys Asp Ile Tyr			
65	70	75	80
aac att caa tat tgg cat tta gct gat act ttt gta tat ttc tct cat	288		
Asn Ile Gln Tyr Trp His Leu Ala Asp Thr Phe Val Tyr Phe Ser His			
85	90	95	
gag cga gtt agc att cct cca gtc aat tgg aca aat gct tgt cat aga	336		
Glu Arg Val Ser Ile Pro Pro Val Asn Trp Thr Asn Ala Cys His Arg			
100	105	110	
aat ggt gta aag tgt tta ggt act ttt tta gta gaa gga aat aac caa	384		
Asn Gly Val Lys Cys Leu Gly Thr Phe Leu Val Glu Gly Asn Asn Gln			
115	120	125	
atg cat gaa atg gaa gcc ttg ctt cac ggt cca cct tta ctt aat aac	432		
Met His Glu Met Glu Ala Leu Leu His Gly Pro Pro Leu Leu Asn Asn			
130	135	140	
act gac gac cct atg aga tta tgg agt ccg tat tat gca gac caa tta	480		
Thr Asp Asp Pro Met Arg Leu Trp Ser Pro Tyr Tyr Ala Asp Gln Leu			
145	150	155	160
gtt gct att gct aaa cac tat ggt ttt gat ggc tgg ttg ttc aat att	528		
Val Ala Ile Ala Lys His Tyr Gly Phe Asp Gly Trp Leu Phe Asn Ile			
165	170	175	
gaa tgc gaa ttc ttt cct ttt cct aca aat cca aaa ttc aaa gct gaa	576		
Glu Cys Glu Phe Phe Pro Phe Pro Thr Asn Pro Lys Phe Lys Ala Glu			
180	185	190	
gag ttg gca aag ttt cta cac tat ttt aag gaa aaa ttg cat aac gaa	624		
Glu Leu Ala Lys Phe Leu His Tyr Phe Lys Glu Lys Leu His Asn Glu			
195	200	205	
ata cct gga tct caa ctc att tgg tac gac agc atg aca aat gaa gga	672		

aaa ggt att gct gac acg gta gaa tct att cct gta cca gga aca gat	1152
Lys Gly Ile Ala Asp Thr Val Glu Ser Ile Pro Val Pro Gly Thr Asp	
370 375 380	
tgg ttt gtt acc aat ttt gat agg ggg ttt gga aat agg ttt tat tat	1200
Trp Phe Val Thr Asn Phe Asp Arg Gly Phe Gly Asn Arg Phe Tyr Tyr	
385 390 395 400	
aga gga aag aga tta ctt tct cag cct tgg tcc cat tta tcg cat caa	1248
Arg Gly Lys Arg Leu Leu Ser Gln Pro Trp Ser His Leu Ser His Gln	
405 410 415	
gct att ctc ccc aat aaa agc tat cga aat cca gag att tat ccc act	1296
Ala Ile Leu Pro Asn Lys Ser Tyr Arg Asn Pro Glu Ile Tyr Pro Thr	
420 425 430	
gat caa aac att aaa atc act agt tct ctc gat tgc gat cat gga gct	1344
Asp Gln Asn Ile Lys Ile Thr Ser Ser Leu Asp Cys Asp His Gly Ala	
435 440 445	
ttt ctt ggt gga acc tcg ctt att atc aaa ggc caa cgt ttc aat cat	1392
Phe Leu Gly Gly Thr Ser Leu Ile Ile Lys Gly Gln Arg Phe Asn His	
450 455 460	
aga gaa tcg cat gat gtt gaa act gaa att agt ata cct ctg tat aag	1440
Arg Glu Ser His Asp Val Glu Thr Glu Ile Ser Ile Pro Leu Tyr Lys	
465 470 475 480	
ctt tca tta gat gct agt aaa gga tgc tca ttg cgt tat att tat aga	1488
Leu Ser Leu Asp Ala Ser Lys Gly Cys Ser Leu Arg Tyr Ile Tyr Arg	
485 490 495	
act ttg ttg atg aaa gat gta aag ttg aca gta gca tgt cac ttt tcg	1536
Thr Leu Leu Met Lys Asp Val Lys Leu Thr Val Ala Cys His Phe Ser	
500 505 510	
tta aaa aca aac gac tca gtt aat ttc ttc aag gta tgg cag cca gat	1584
Leu Lys Thr Asn Asp Ser Val Asn Phe Phe Lys Val Trp Gln Pro Asp	

Val Val Asn Ala Trp Glu Glu Ile Asp Tyr Tyr Asn Val Phe Tyr Lys	
675	680
685	
gaa agt gac gac tct gca act cgc atc ttt tta gga aca gca ttc tgt	2112
Glu Ser Asp Asp Ser Ala Thr Arg Ile Phe Leu Gly Thr Ala Phe Cys	
690	695
700	
aat caa ttt cgt gta tct ggt tta gat att att tta tct aag cta cca	2160
Asn Gln Phe Arg Val Ser Gly Leu Asp Ile Ile Leu Ser Lys Leu Pro	
705	710
715	720
aag ata gtt att gaa gct gtt aac aaa gaa gga tac atc tct tca agt	2208
Lys Ile Val Ile Glu Ala Val Asn Lys Glu Gly Tyr Ile Ser Ser Ser	
725	730
735	
ggt agc ata gat ttg tca tta aac tag	2235
Gly Ser Ile Asp Leu Ser Leu Asn	
740	745

<210> 3

<211> 744

<212> PRT

<213> Mucor hiemalis

<400> 3

Met Pro Ser Leu Gln Leu Gln Pro Asp Asp Lys Leu Ala Pro Val Ser	
1	5
10	15
Phe Ala Leu Lys Ser Met Asn Glu Leu Arg Asp Trp Thr Pro Asp Glu	
20	25
30	
Lys Ile Lys Phe Asn Val Ser Ser Val Ala Leu Gln Pro Arg Val Lys	
35	40
45	
Asn Ala Leu Lys Pro Gln Leu Leu Leu Thr His Asp Met Ala Gly Gly	

50	55	60
Tyr Lys Glu Asp Lys Asn Ile Gln Gly Asn Asn Tyr Lys Asp Ile Tyr		
65	70	75
Asn Ile Gln Tyr Trp His Leu Ala Asp Thr Phe Val Tyr Phe Ser His		
85	90	95
Glu Arg Val Ser Ile Pro Pro Val Asn Trp Thr Asn Ala Cys His Arg		
100	105	110
Asn Gly Val Lys Cys Leu Gly Thr Phe Leu Val Glu Gly Asn Asn Gln		
115	120	125
Met His Glu Met Glu Ala Leu Leu His Gly Pro Pro Leu Leu Asn Asn		
130	135	140
Thr Asp Asp Pro Met Arg Leu Trp Ser Pro Tyr Tyr Ala Asp Gln Leu		
145	150	155
Val Ala Ile Ala Lys His Tyr Gly Phe Asp Gly Trp Leu Phe Asn Ile		
165	170	175
Glu Cys Glu Phe Phe Pro Phe Pro Thr Asn Pro Lys Phe Lys Ala Glu		
180	185	190
Glu Leu Ala Lys Phe Leu His Tyr Phe Lys Glu Lys Leu His Asn Glu		
195	200	205
Ile Pro Gly Ser Gln Leu Ile Trp Tyr Asp Ser Met Thr Asn Glu Gly		
210	215	220
Glu Ile His Trp Gln Asn Gln Leu Thr Trp Lys Asn Glu Leu Phe Phe		
225	230	235
Lys Asn Thr Asp Gly Ile Phe Leu Asn Tyr Trp Trp Lys Lys Glu Tyr		
245	250	255
Pro Glu Met Ala Arg Arg Val Ala Glu Gly Ile Gly Arg Ser Gly Leu		
260	265	270
Glu Val Tyr Phe Gly Thr Asp Val Trp Gly Arg His Thr Tyr Gly Gly		
275	280	285

Gly Gly Phe Lys Ser Tyr Lys Gly Val Lys Thr Ala Tyr Ser Ala Met
 290 295 300
 Thr Ser Ser Ala Leu Phe Gly Met Ala Trp Thr Tyr Glu His Phe Glu
 305 310 315 320
 Lys Ser Glu Phe Glu Lys Met Asp Arg Leu Phe Trp Cys Gly Gly Lys
 325 330 335
 Tyr Ser Asp Tyr Pro Pro Pro Pro Pro Lys Asn Pro Asp Asp Glu Lys
 340 345 350
 Glu Val Glu Ser Asp Asp Ser Glu Asp Glu Leu Met Tyr Gly His Lys
 355 360 365
 Lys Gly Ile Ala Asp Thr Val Glu Ser Ile Pro Val Pro Gly Thr Asp
 370 375 380
 Trp Phe Val Thr Asn Phe Asp Arg Gly Phe Gly Asn Arg Phe Tyr Tyr
 385 390 395 400
 Arg Gly Lys Arg Leu Leu Ser Gln Pro Trp Ser His Leu Ser His Gln
 405 410 415
 Ala Ile Leu Pro Asn Lys Ser Tyr Arg Asn Pro Glu Ile Tyr Pro Thr
 420 425 430
 Asp Gln Asn Ile Lys Ile Thr Ser Ser Leu Asp Cys Asp His Gly Ala
 435 440 445
 Phe Leu Gly Gly Thr Ser Leu Ile Ile Lys Gly Gln Arg Phe Asn His
 450 455 460
 Arg Glu Ser His Asp Val Glu Thr Glu Ile Ser Ile Pro Leu Tyr Lys
 465 470 475 480
 Leu Ser Leu Asp Ala Ser Lys Gly Cys Ser Leu Arg Tyr Ile Tyr Arg
 485 490 495
 Thr Leu Leu Met Lys Asp Val Lys Leu Thr Val Ala Cys His Phe Ser
 500 505 510
 Leu Lys Thr Asn Asp Ser Val Asn Phe Phe Lys Val Trp Gln Pro Asp

<210> 4

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> partial amino acid sequence of endo- β -N-acetylglucosaminidase

<400> 4

Pro Ser Leu Gln Leu Gln Pro Asp Asp Lys

1

5

10

<210> 5

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> oligonucleotide designed based on the partial amino acid
sequence of endo- β -N-acetylglucosaminidase

<220>

<221> modified_base

<222> 12

<223> n represents a, g, c or t

<400> 5

carttrcarc cngaygayaa

20

<210> 6

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> partial amino acid sequence of endo- β -N-acetylglucosaminidase

<400> 6

Ser Tyr Arg Asn Pro Glu Ile Tyr Pro Thr Asp Gln Asn Ile Lys

1

5

10

15

<210> 7

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> oligonucleotide designed based on the partial amino acid
sequence of endo- β -N-acetylglucosaminidase

<220>

<221> modified_base

<222> 6

<223> n represents a, g, c or t

<400> 7

cchacngayc araayatya

20

<210> 8

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> oligonucleotide designed based on the partial amino acid
sequence of endo- β -N-acetylglucosaminidase

<220>

<221> modified_base

<222> 15

<223> n represents a, g, c or t

<400> 8

ttratrtyt grtcngtdgg

20

<210> 9

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> partial amino acid sequence of endo- β -N-acetylglucosaminidase

<400> 9

Gly Gln Arg Phe Asn His Arg Glu Ser His Asp Val Glu Thr Glu Ile

1

5

10

15

<210> 10

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> oligonucleotide designed based on the partial amino acid
sequence of endo- β -N-acetylglucosaminidase

<400> 10

tgrtttraadc gytgdccytt

20

<210> 11

<211> 23

<212> DNA

<213> Artificial Sequence

<220>

<223> oligonucleotide sequence of 5' terminal region of

endo- β -N-acetylglucosaminidase gene

<400> 11

atgccttcac ttcaattgca acc

23

<210> 12

<211> 23

<212> DNA

<213> Artificial Sequence

<220>

<223> oligonucleotide sequence of 3' terminal region of
endo- β -N-acetylglucosaminidase gene

<400> 12

ctagtttaat gacaaatcta tgc

23

<210> 13

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> oligonucleotide designed based on the sequence of
endo- β -N-acetylglucosaminidase gene

<400> 13

<210> 16
<211> 38
<212> DNA
<213> Artificial Sequence

<220>

<223> oligonucleotide designed based on the sequence of
endo- β -N-acetylglucosaminidase gene

<400> 16
ccgcggccg cctagtttaa tgacaaatct atgctacc

38

<210> 17
<211> 10
<212> PRT
<213> Mucor hiemalis

<400> 17
Pro Ser Leu Gln Leu Gln Pro Asp Asp Lys
1 5 10

<210> 18
<211> 16
<212> PRT
<213> Mucor hiemalis

<400> 18

Lys Ser Tyr Arg Asn Pro Glu Ile Tyr Pro Thr Asp Gln Asn Ile Lys

1

5

10

15

<210> 19

<211> 14

<212> PRT

<213> Mucor hiemalis

<400> 19

Lys Phe Asn Val Ser Ser Val Ala Leu Gln Pro Arg Val Lys

1

5

10

<210> 20

<211> 11

<212> PRT

<213> Mucor hiemalis

<220>

<221> PEPTIDE

<222> 2

<223> Xaa represents Met or Ser

<400> 20

Lys Xaa Asp Arg Leu Phe Leu Cys Gly Gly Lys

1

5

10

<210> 21
<211> 17
<212> PRT
<213> Mucor hiemalis

<220>
<221> PEPTIDE
<222> 2
<223> Xaa represents Gly or Met

<220>
<221> PEPTIDE
<222> 3
<223> Xaa represents Gln or Ala

<220>
<221> PEPTIDE
<222> 4
<223> Xaa represents Arg or Leu

<220>
<221> PEPTIDE
<222> 6
<223> Xaa represents Asn or Pro

<220>
<221> PEPTIDE
<222> 8
<223> Xaa represents Arg or Leu

1

5

10

15

<210> 23

<211> 9

<212> PRT

<213> Mucor hiemalis

<400> 23

Lys Asn Ile Gln Gly Asn Asn Tyr Lys

1

5

<210> 24

<211> 11

<212> PRT

<213> Mucor hiemalis

<400> 24

Lys Tyr Ser Asp Tyr Pro Pro Pro Pro Pro Lys

1

5

10

<210> 25

<211> 8

<212> PRT

<213> Mucor hiemalis

<400> 25

Lys Leu Ser Leu Asp Ala Ser Lys

1

5

<210> 26

<211> 13

<212> PRT

<213> Mucor hiemalis

<400> 26

Lys Asn Thr Asp Gly Ile Phe Leu Asn Tyr Trp Trp Lys

1

5

10

<210> 27

<211> 15

<212> PRT

<213> Mucor hiemalis

<220>

<221> PEPTIDE

<222> 3

<223> Carboxymethylcystein

<400> 27

Lys Gly Cys Ser Leu Arg Tyr Ile Tyr Arg Thr Leu Leu Met Lys

1

5

10

15

[illegible]

<400> 30

Lys Ser Met Asn Glu Leu Arg Asp Trp Thr Pro Asp Glu Lys

1 5 10

<210> 31

<211> 10

<212> PRT

<213> Mucor hiemalis

<400> 31

Lys Leu Ala Pro Val Ser Phe Ala Leu Lys

1 5 10

<210> 32

<211> 23

<212> PRT

<213> Mucor hiemalis

<400> 32

Lys Gly Gln Arg Phe Asn His Arg Glu Ser His Asp Val Glu Thr Glu

1 5 10 15

Ile Ser Ile Pro Leu Tyr Lys

20

<210> 33

<211> 22

<212> PRT

<213> Mucor hiemalis

<220>

<221> PEPTIDE

<222> 8

<223> Carboxymethylcystein

<400> 33

Lys Ile Thr Ser Ser Leu Asp Cys Asp His Gly Ala Phe Leu Gly Gly

1

5

10

15

Thr Ser Leu Ile Ile Lys

20

<210> 34

<211> 19

<212> PRT

<213> Mucor hiemalis

<400> 34

Lys Asn Glu Leu Phe Phe Lys Asn Thr Asp Gly Ile Phe Leu Asn Tyr

1

5

10

15

Trp Trp Lys

<210> 35

<211> 9

<212> PRT

<213> Mucor hiemalis

<400> 35

Lys Ile Val Ile Glu Ala Val Asn Lys

1

5

<210> 36

<211> 11

<212> PRT

<213> Mucor hiemalis

<400> 36

Ser Ser Arg Ile Ile Gln Asp Leu Phe Trp Lys

1

5

10

<210> 37

<211> 14

<212> PRT

<213> Mucor hiemalis

<400> 37

Lys Thr Asp Ser Ser Arg Ile Ile Gln Asp Leu Phe Trp Lys

1

5

10